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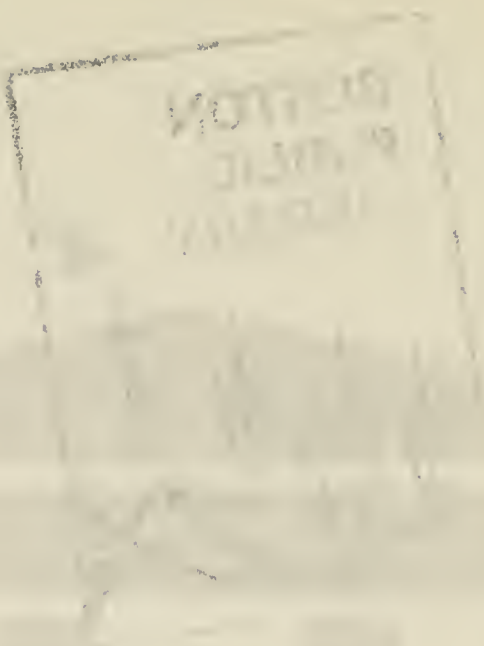
Boston Water and Sewer Commission

SUPPORTING DOCUMENTATION FOR THE PROPOSED 1988 RATE SCHEDULE

FEBRUARY , 1988



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I. INTRODUCTION

I.-1 History

Prior to August 5, 1977, the City of Boston provided water and sewer services to approximately 87,000 accounts in the City through its Public Works Department. On that date, the responsibility for providing such services was transferred by an act of the State Legislature to the Boston Water and Sewer Commission (BWSC or Commission), a political subdivision of the Commonwealth of Massachusetts. This statute mandated that fees, rates and charges for water and sewerage services be established on just and equitable standards and that all consumers, whether public or private, taxpayer or tax exempt, resident or commuter, pay their fair share of the costs of such services based on their actual usage.

In order to accomplish these goals, the statute that created BWSC mandated a number of changes in the rate structure for services provided. Two important changes under the Commission's Enabling Legislation included the use of a flat rate structure (i.e., a fixed amount per cubic foot as compared to declining block rates under the City of Boston) for establishing water rates and the provision of a discount on water charges for the elderly and fully disabled.

These mandated changes were incorporated in all the detailed rate studies performed by the BWSC from inception through 1984. During 1985, the Commission conducted an extensive review of its existing rate structure and examined its conservation policies and practices. BWSC also evaluated alternative rate structures which had become allowable due to the passage of the Enabling Legislation of the Massachusetts Water Resources Authority (MWRA or Authority). This agency was created

to replace the Water and Sewerage Divisions of the Metropolitan District Commission (MDC).

Until 1985, the MDC, a state agency, had provided water supply and wastewater treatment services to the BWSC and a number of other communities in the Metropolitan Boston area. The Commission was assessed annually for water purchased from the Water Division of the MDC and for wastewater services supplied by the Sewerage Division of the MDC. In order to improve the delivery of water and wastewater services, encourage conservation, and reduce water pollution in Eastern Massachusetts, the Massachusetts Legislature created the Authority, a political subdivision of The Commonwealth of Massachusetts, on January 1, 1985.

The MWRA's Enabling Legislation required that the possession, control and operation of the MDC's Water and Sewerage Divisions be transferred to the MWRA, which commenced operations on July 1, 1985. The MWRA's Enabling Legislation prohibited the use of the traditional declining water rate structures, but permitted the use of an inclining block rate structure. The Enabling Legislation also called for a comprehensive study of the environmental, social, and economic impacts of its water and sewer charges, which was completed in December, 1986.

In response to the MWRA's various legislative mandates, in particular, to its emphasis on water conservation, and based upon the Commission's 1985 rate structure review, BWSC staff determined that there was a need for an external stimulus to promote water conservation among its customers. It became apparent that the most reasonable alternative was to implement a progressive rate structure to promote conservation. This was

accomplished in August, 1985, with the adoption of an inclining block rate structure.

I.-2 Staff Recommendations

The Commission's change to an inclining block rate structure on August 1, 1985 has allowed the BWSC to reinforce regional conservation incentives to its customers and will help to conserve water resources for the future. The adoption of this rate structure has also contributed to the Commission's efforts to comply with the conservation mandates of the MWRA legislation. Moreover, since the completion by the MWRA of their legislatively mandated Environmental, Social and Economic Impact Report of Water and Sewer Charges, the Authority decided to maintain its current water and sewer rate methodologies during Fiscal Year 1988, and for Fiscal Year 1989 and is encouraging communities to enforce conservation-based rates at retail levels. In this regard, BWSC staff is recommending to the Board of Commissioners that the inclining block rate structure consisting of ten tiers, adopted in 1985, be continued in 1988 to encourage more efficient and less wasteful use of water in the City of Boston.

In general, the first four blocks of the ten block tier correspond to customers in single family homes and small multi-unit residences, professional or commercial users. Customers reaching the fifth through eighth blocks will generally be large multi-unit residences, medium to large commercial businesses or small industries. The ninth and tenth blocks are charged almost exclusively to medium and large industrial customers.

In addition to ensuring the adequacy of its rate structure with respect to full cost recovery, the Commission must consider

a number of requirements in the review of its rates. In this regard the Commission must ensure compliance with existing legislation, bond resolutions, and rate covenants, and must also ensure equitable treatment for all Commission customers. This document summarizes the review process that has been employed by the Staff and presents the proposed rates for 1988.

It is proposed that a 27.8% combined rate increase for all blocks become effective on April 1, 1988. The proposed rate schedule is shown in Exhibit A, (pg. 7).

I.-3 Methodology

The process utilized for developing the 1988 rates is similar to the methodology used in the past, incorporates policies which are in conformity with sound and appropriate rate making practices used by similar organizations, and is"... generally accepted as appropriate regulatory practice".[1]

The methodology used in developing 1988 Rates proceeded through the following steps:

- o Legislative Analysis - A review was made of the various state legislation affecting the rate setting process, including the Act creating the MWRA. The variety of legislation affecting rates substantially prescribes the method of setting rates.
- o Financial Analysis - A detailed analysis including projections of the financial condition of the Commission was performed for calendar year 1988. Forecasts were made of all operating costs, MWRA assessments, debt service and working capital, requirements, and capital needs.

[1] Deloitte, Haskins & Sells, BWSC 1986 Audited Financial Statements Footnote No. 1

- o Water Use Analysis - An analysis was performed of the sources and uses of water to forecast water consumption and wastewater flows and to estimate, for billing purposes, the amount of water and sewer service utilized by BWSC customers.

- o Rate Calculation - Prior to determining the proposed rates, miscellaneous revenues, adjustments, delinquencies and allowances were estimated. Based upon these estimates, and appropriate legal considerations, the proposed rates were calculated as specified below.

I.-4 Summary

Relevant legislation, including the MWRA Act, together with precedent established by the BWSC Act require the utilization of "proportionate" water and sewer rates, i.e. a fixed amount per cubic foot. In addition, rates established by BWSC must be sufficient to permit the operation of the Commission to be self-sustaining. Any surplus generated is, by legislation, either returned to the City of Boston or utilized to offset the following year's rates, and any deficit is to be recovered in the following year's rates. Application of the required cost allocation methods to the estimated level of expenses for 1988 results in the inclining block rate schedule shown in Exhibit A (pg. 7), proposed to be effective April 1, 1988. The projected impact of the proposed rate schedule on a selected group of customers is shown in Exhibit B (pg. 8).

In addition, a set of special service fees, designed to recover costs, is summarized in Exhibit C (pg. 9). This year, staff is proposing the introduction of fees for two additional services performed by the Commission. A fee of $150 per diem is being proposed to recover the Commission's costs of providing the necessary water and sewer inspectional services associated with construction projects of one or more days duration. Staff is

also proposing that a Special Service Fee be established, as set forth in Exhibit C (pg. 9), for the cost of replacing a customer's water meter which, in the professional opinion of the Commission, has become inoperative due to freezing . The proposed special fire service fee schedule is summarized in Exhibit D (pg. 11).

The Commission assesses a 12% per annum late payment charge on accounts which are not paid within 45 days of the billing date (see Exhibit E on pg. 11).

The elderly and fully disabled residents of the City currently receive a 15% discount on all water charges. In 1987, this resulted in a decrease in water charges to the disabled and elderly of approximately $196,000. Staff is proposing that the elderly and disabled water discount be increased to a level of 20% effective April 1, 1988. It is projected that the total savings in water charges for the elderly and the disabled in 1988 will be approximately $320,000. The conditions that pertain to this discount are presented in Exhibit F (pg. 11).

Exhibit A

PROPOSED WATER AND SEWER RATES
PROPOSED AS OF APRIL 1, 1988

Consumption	<------Water Rate------>		<------Sewer Rate------>	
(Cu. Ft./Day)	/1000 cu.ft.	/1000 gal.	/1000 cu.ft.	/1000 gal.
First 19	$12.230	$1.635	$11.930	$1.595
Next 20	$12.250	$1.638	$12.080	$1.614
Next 50	$12.280	$1.642	$12.220	$1.633
Next 70	$12.320	$1.646	$12.350	$1.651
Next 190	$12.350	$1.651	$12.490	$1.670
Next 250	$12.370	$1.653	$12.630	$1.689
Next 700	$12.400	$1.658	$12.770	$1.708
Next 1700	$12.430	$1.662	$12.910	$1.726
Next 3000	$12.450	$1.665	$13.050	$1.745
Over 5999	$12.480	$1.669	$13.190	$1.763

EXHIBIT B

BOSTON WATER AND SEWER COMMISSION
IMPACT OF EXISTING AND PROPOSED RATES
PER QUARTERLY BILLING PERIOD

CUSTOMER TYPE	METERED USE CU FT DAY(1)	RATE BLOCK(2)	CURRENT WATER	CURRENT SEWER	CURRENT COMBINED	PROPOSED WATER	PROPOSED SEWER	PROPOSED COMBINED	INCREASE PER QUARTER
1 FAMILY RESIDENTIAL	8	1	$6.41	$7.35	$13.76	$8.90	$8.69	$17.59	$3.83
1 FAMILY RESIDENTIAL	17	1	13.63	15.62	29.25	18.92	18.46	37.38	8.13
1 FAMILY RESIDENTIAL	33	2	26.48	30.47	56.95	36.75	36.02	72.77	15.82
2 FAMILY RESIDENTIAL	53	3	42.58	49.19	91.77	59.09	58.18	117.27	25.50
3 FAMILY RESIDENTIAL	80	3	64.32	74.55	138.87	89.26	88.21	177.47	38.60
4 FAMILY RESIDENTIAL	107	4	86.10	100.09	186.19	119.49	118.44	237.93	51.74
6 FAMILY RESIDENTIAL	160	5	128.88	150.40	279.28	178.92	178.02	356.94	77.66
MULTI-FAMILY RESIDENTIAL	334	5	269.65	317.29	586.94	374.47	375.79	750.26	163.32
COMMERCIAL	535	6	432.59	511.94	944.53	600.70	606.61	1,207.31	262.78
GOVERNMENTAL	668	7	540.55	641.53	1,182.08	750.60	760.35	1,510.95	328.87
LARGE RESIDENTIAL	1,003	7	812.79	969.54	1,782.33	1,128.62	1,149.64	2,278.26	495.93
MEDIUM GOVERNMENTAL	1,337	8	1,084.27	1,296.96	2,381.23	1,505.61	1,538.26	3,043.87	662.64
SMALL INDUSTRIAL	2,005	8	1,628.33	1,957.73	3,586.06	2,261.20	2,323.03	4,584.23	998.17
LARGE RESIDENTIAL	2,941	8	2,390.65	2,883.59	5,274.24	3,319.94	3,422.65	6,742.59	1,468.35
LARGE INSTITUTIONAL	4,679	9	3,809.22	4,619.59	8,428.81	5,288.90	5,485.88	10,774.78	2,345.97
MEDIUM COMMERCIAL	6,016	10	4,900.61	5,955.66	10,856.27	6,803.70	7,073.85	13,877.55	3,021.28
LARGE COMMERCIAL	10,695	10	8,728.45	10,677.66	19,406.11	12,117.55	12,690.01	24,807.56	5,401.45
MEDIUM INDUSTRIAL	13,369	10	10,916.02	13,376.24	24,292.26	15,154.35	15,899.58	31,053.93	6,761.67
VERY LARGE RESIDENTIAL	20,053	10	16,384.14	20,121.66	36,505.80	22,745.24	23,922.32	46,667.56	10,161.76
LARGE INSTITUTIONAL	30,080	10	24,587.12	30,240.81	54,827.93	34,132.70	35,957.63	70,090.33	15,262.40
VERY LARGE INSTITUTIONAL	53,476	10	43,727.16	53,851.82	97,578.98	60,703.07	64,039.61	124,742.68	27,163.70
VERY LARGE INDUSTRIAL	66,845	10	54,664.20	67,343.68	122,007.88	75,885.98	80,086.29	155,972.27	33,964.39
VERY LARGE GOVERNMENTAL	86,898	10	$71,069.36	$87,580.97	$158,650.33	$98,659.77	$104,155.70	$202,815.47	$44,165.14

(1) 1 CUBIC FOOT = 7.48 GALLONS
(2) REPRESENTS THE FINAL RATE BLOCK INTO WHICH AVERAGE DAILY CONSUMPTION FALLS

Exhibit C

SPECIAL SERVICE FEE SCHEDULE

Type	Fee
Lien Certificate(1)	$100 Maximum
Return Check Processing Fee	$ 15
Cross Connection Inspection(2)	$ 75
Water Service Installation	$135-$425 (depending on pipe size)
Excavation	Cost Basis, $900 Deposit
Fire Pipe Excavation	Cost Basis, $2,500 Deposit
Water Pipe Inspection	$110
Sewer Pipe Inspection	$110
Water and Sewer Construction Multi-day Inspection (3)	$150 per diem
Water Turn-on (4)	$ 25
Water Turn-off (4)	$ 25
Fire Flow Test	$150
Temporary Connection:	
Less than 2 days	$ 25
Greater than 2 days(5)	$ 50 ($250 deposit, plus water usage)
Special Meter Test (6) (meters 2 inch or smaller)	$ 40 Deposit
Special Meter Test (6) (meters 3 inch or larger)	Cost Basis
Drain Layers License	$ 12
Construction Plans and Drawings(7)	$ 2
Special Consultation Services (8)	
Rates per hour for Commission staff personnel:	
Senior Management	$ 75
Professional and Other	$ 50
Clerical	$ 25
Frozen Meter Replacement (9)	Cost Basis

(1) In accordance with M.G.L. Chapter 60, Section 23A: "...for land of less than one acre upon which there is no permanent structure a fee of ten dollars; for land upon which is situated no more than a single family residence and outbuildings a fee of fifteen dollars; for land upon which is situated no more than a three family residence with outbuildings a fee of twenty dollars; for land upon which is situated a residence for four or more families a fee of forty dollars; for land upon which is situated a commercial, industrial or public utility structure a fee of one hundred dollars; for farms, forest land and all other real property a fee of fifty dollars. In no case shall the fee exceed one half of one percent of the assessed value of the real estate...." Maximum fee, one hundred dollars.

(2) Requires semi-annual inspection of each device.

(3) This daily fee is assessed for providing water and sewer inspectional services on construction projects of one or more days duration.

(4) From services affected by the Commission's termination of service procedures.

(5) Renewable every 90 days.

(6) No charge if meter is over-registering, based on A.W.W.A. standards or if Commission ordered test.

(7) Additional information concerning maps may be obtained from the Commission on request. Public agencies and BWSC consultants receive prints at no charge. The cost per map is detailed below:

Type	Cost
I. Base Maps	
- Prints	$ 2/sheet
- Paper Sepias	$ 3/sheet
- Mylar Sepias*	$ 50/set plus printer's charge
- Washoff Mylars*	$ 50/set plus printer's charge
II. Water and Sewer Maps	
- Prints	$ 2/sheet
- Paper Sepias	$ 3/sheet
- Mylar Sepias	Not Available
- Washoff Mylars	Not Available

*Sold to government agencies only

(8) For special water and sewer consultation services rendered to persons other than rate payers of the Commission and for special engineering services.

(9) For replacement of frozen meters.

Size of Meters	Replacement Fee
5/8"	$ 86.71
3/4"	114.26
1"	129.76
1 1/2"	255.76
2"	320.01

Exhibit D

SPECIAL FIRE SERVICE FEES:
(INTERNAL SPRINKLERS AND STANDPIPES)

Size of Service	Quarterly Charge
4 inch or smaller	$ 56.75
6 inch	$127.50
8 inch or larger	$226.50

Exhibit E
LATE PAYMENT CHARGE

.03288% interest per day compounded with each billing on all amounts past due (greater than 45 days from the billing date).

Exhibit F

DISCOUNT FOR ELDERLY AND FULLY DISABLED

A proposed 20% discount on all water charges billed. This discount is applicable only to owner-occupied structures with 1 to 4 dwelling units.

II. DESCRIPTION OF BOSTON'S WATER AND SEWAGE SYSTEM

II.-1 Water Distribution System

The Commission's water distribution system serves 87,460 customer accounts and a resident population of 601,095 (1). The distribution system consists of water mains, service pipes, hydrants, valves, and gates.

There are approximately 1,182 miles of mains, which range in size from 2 to 48 inches in diameter. The system includes a high pressure fire system, serving downtown Boston, and approximately 13,300 hydrants.

The system contains four major water service (pressure) networks: 1) The Southern Low Service, 2) The Northern Low Service, 3) The Southern High Service, and 4) The Southern Extra High Service. In addition, a small section of East Boston is served by a single connection to the Northern High Service System.

The Commission obtains its water from the MWRA, whose major sources are the Quabbin and Wachusetts Reservoirs which are located in western and central Massachusetts respectively. Water is conveyed from the supply reservoirs via MWRA distribution reservoirs for delivery to the Commission's service networks. The City is supplied through 29 metered connections from the MWRA distribution system.

Boston's public water system began operating in 1848. The present water distribution system operated by the Commission is the result of expansion and improvements to meet the City's needs since that time.

(1) 1985 State Census

II.-2 Sewage Collection System

The Commission's sewer system collects wastewater and storm drainage in the City of Boston. Each day it serves 601,095 residents, 575,000 workers, 70,000 shoppers, tourists and business visitors as well as businesses, industries, and institutions. There are approximately 90,000 wastewater service connections. The system consists primarily of conduits, which range in size from 6 inch clay lateral sewers to 20 by 15-1/2 foot concrete culverts. There are approximately 1,340 linear miles of sewers, including 535 miles of sanitary sewers, 490 miles of storm drains, and 315 miles of combined sewers. Other facilities include 8 pumping stations, 2 gatehouses, 64 combined sewer overflow outlets, 163 regulators, and 112 tidegates.

The backbone of the wastewater collection system is the Boston Main Drainage System, which was built between 1877 and 1884. It includes five combined interceptors, the Calf Pasture pumping station and the Dorchester Bay tunnel, all of which are still in service. The Main Drainage System serves downtown Boston, Back Bay, South End, Roxbury, Dorchester, and South Boston. Construction began in 1982 to replace two of the original interceptors. The New Boston Main Interceptor has been completed and the New East Side Interceptor is scheduled to be completed in 1988. Additional collection facilities provide service to other parts of the City. Most of the other neighborhoods are served by separate sanitary sewers and storm drains.

The collection system transports Boston's wastewater flows to MWRA facilities for treatment and disposal. Wastewater is treated either at MWRA's Nut Island plant in Quincy, or Deer Island plant in Boston, and then discharged into Boston Harbor.

III. RATE HISTORY AND METHODOLOGY

III.-1 Rate History and Methodology

RATE HISTORY

(per 1,000 cubic feet)

	Water Rate	Sewer Rate	Combined Rate	% Change From Prior Year
1977(1)	$7.65	$1.00	$8.65	-
1978	$8.90	$3.96	$12.86	48.7%
1979	$7.55	$3.59	$11.14	(13.4%)
1980	$7.55	$4.04	$11.59	4.0%
1981	$7.55	$4.04	$11.59	0.0%
1982	$7.55	$4.94	$12.49	7.8%
1983	$7.48	$5.46	$12.94	3.6%
1984	$7.63	$6.28	$13.91	7.5%
1985(2)	$7.74	$7.15	$14.89	7.0%
1986(2)	$8.64	$9.51	$18.15	21.9%
1987(2)	$8.90	$10.60	$19.50	7.4%
1988	See Proposed Rate Schedule -- Exhibit A (pg. 7)			

The above table summarizes the City's water and sewer rates for the period 1977 through 1987. Since the Commission's assumption of operational responsibility for the system on January 1, 1978, the rate structure has generated sufficient revenues to meet all associated expenses. The increases in the sewer rate throughout the period shown below are a result of mandated

(1) 1977 water and sewer rates were established by the City prior to the creation of the Boston Water and Sewer Commission.

(2) Due to the shift to the inclining block rate structure, the figures presented for 1985, 1986 and 1987 represent a weighted average water and sewer rate.

federal and state wastewater requirements, increases in MDC/MWRA sewer assessments, and the change from a subsidized sewer rate in 1977 to a self-supporting BWSC sewer rate in 1978. While the water rate had remained relatively stable through 1985, the weighted average 11.6% increase in 1986 was largely due to the substantial increase in the MWRA water assessment for that period.

The wholesale water rate charged by the MDC to members of the water district had risen from $240/mg in 1978 to $245/mg in 1984. Concurrently, because of the Commission's aggressive leak detection, repair and conservation programs, the volume of water purchased by BWSC had decreased from a level of 143 MGD in 1978 to 117 MGD in 1984. As a result, the MDC's water assessments to Boston decreased during that period, thus allowing the water rate to absorb some of the effects of inflation in other expense categories without increasing the water rate. Since the 1985 transition from the MDC to the MWRA, the wholesale water rate has risen 45.7%, from $245/mg in 1984 to $357/mg in 1987. The MWRA water rate is projected to increase again by an additional 35.6% on July 1, 1988 to a level of $484/mg. These substantial compounding increases in MWRA water assessments are the major factor forcing the Commission to increase its recent BWSC water rates from the relatively stable levels which had been maintained through 1984. It is anticipated that the MWRA, which is required to be financially self-sustaining, will continue to increase the water rate to its customers on an annual basis.

During the same eight year period, from 1978 to 1985, the MDC/MWRA's sewerage assessment to the BWSC increased by an average of 7.9% per year. In 1987, BWSC's liability to the MWRA

for wastewater services was $5.31 million higher than in 1986, an increase of 38%. Sewerage assessment increases by the MWRA in recent years are one of the major reasons for increases in the Commission's sewer rate. For 1988, the MWRA's fiscal year assessment to BWSC represents a 48.9% increase over their immediately preceeding fiscal year assessment. In addition, sewer maintenance and construction funding levels have been increased to assure compliance with federal, state, and local clean water requirements. For 1988, MWRA sewer charges are projected to be $5.0 million higher than the actual 1987 assessment. Because of state and federal clean water requirements, it is expected that future MWRA sewerage assessments to BWSC and the other members of the sewerage district will be significantly higher than past assessments.

Current MWRA projections show annual increases ranging from 30% to 40% over the next five years. Currently, the MWRA is proposing a change in their billing practices which would require communities to make quarterly payments as opposed to the existing practice of semi-annual payments. This proposed billing schedule is structured such that the Commission will be paying 45% of the MWRA's Fiscal Year 1989 assessment during 1988. The amounts which have been included in the Commission's 1988 operating budget reflect the impact of this revision in the MWRA's billing practice. BWSC Staff will continue to monitor all rate and rate methodology proposals by the MWRA to ensure equitable assessments to the BWSC.

III.-2 Historical Rate Setting Factors

In establishing water and sewer rates for 1988, the following factors were considered:

Approximately 67% of the water purchased from the MWRA was billed to BWSC's customers in 1987. The remainder was lost due to a number of reasons, including system leaks, meter slippage and water used for fire fighting. However, the percent of unaccounted for water has decreased by 30% since the formation of the Commission primarily due to six factors:

1) An increased leak detection program, which has resulted in the identification of water leaks accounting for over 26 million gallons of lost water per day. The correction of these leaks is an ongoing program of the Commission.

2) Billings to the City of Boston for its water use, currently estimated to be approximately 3 million gallons per day in 1988.

3) The BWSC's metering program which is addressing the under-registration problem inherent in aging meters.

4) The Commission also established a program to monitor and test the accuracy of the water meters of its large consumers.

5) Careful monitoring of the MWRA's water meters to correct faulty meters and minimize water purchases.

6) An increasing trend toward water conservation efforts, both in the City of Boston and the MWRA region.

Before the establishment of the Commission in 1978, typically only 70% of water and sewer bills were paid within 18 months. Unpaid bills were then added to property taxes. Thus tax exempt users who did not pay their bills were eventually subsidized by the City's taxpayers via the property tax rate. Since 1978, collections by the Commission have reached approximately 98% of billings within 12 months and they are continuing to improve. (This is discussed more fully on pg. 39).

The largest single item in the BWSC's budget is the MWRA assessment which represents approximately 39% of total expenses. The methodology used by the MWRA in assessing charges to the BWSC and the timing of payments to the MWRA are generally prescribed by law.

Upon its formation, the Commission received, among other assets, Accounts Receivable of approximately $33 million. This represented water and sewer consumption, both billed and unbilled, which took place prior to January 1, 1978. Staff is monitoring the collection and use of these funds, which have largely been used for working capital and funding reserve requirements. This is discussed more fully in Section VI, "Debt Service Requirements."

Progress in these areas will continue through the 1988 rate year. Comprehensive rate setting dictates that the impact of all of these factors be incorporated into the projections of revenues and expenses.

III.-3 Current Rate Setting Methodology

The 1988 rate setting process consisted of the following steps:

Legislative Review - Pertinent federal and state legislation, as well as Commission policy, were reviewed to establish a framework for setting rates. This review produced the following guidelines:

- o BWSC must be self-sustaining.
- o Water and sewer rates must be proportionate.
- o The City of Boston, unbilled prior to 1978, is billed for water and sewer services.
- o The discount for the elderly/fully disabled as required by the enabling legislation is applied to water service.
- o A number of major capital projects have been initiated for the sewer system as a result of the Commission's National Pollutant Discharge Elimination System (N.P.D.E.S) permit issued by the Environmental Protection Agency (EPA).
- o The sewer rate must meet certain federal requirements in order to be an approved EPA user charge, and for BWSC to remain eligible for available state and federal grant funding.

- Legislation creating the MWRA permits the use of an inclining block rate structure, and mandates conservation efforts in the region.

Financial Analysis - A number of financial analyses were reviewed or prepared by Commission Staff. These included:

- BWSC's approved three-year Capital Improvement Program 1988-1990.
- The projected year-end 1987 financial position of the BWSC, on a rate basis.
- An operating budget for 1988.
- The Report of Consulting Engineer, Camp, Dresser & McKee, Inc., entitled Boston Water and Sewer Commission, the Boston Water Distribution System, May 1987.
- The Report of Consulting Engineer, Camp, Dresser & McKee, Inc., entitled Boston Water and Sewer Commission, Water and Sewer Facility and Financial Analysis Summary Report, July 1986.
- The Report of Consulting Engineer, Camp, Dresser & McKee Inc., entitled Boston Water and Sewer Commission, Supporting Documentation for the 1985 Rate Schedule, June 1985.
- A review and re-assessment of customers' consumption trends since the inception of the inclining block rate structure.
- A review of the Commission's Resolution Establishing Issue of Revenue Bonds and all supplements thereto.
- A review of the Commission's working capital requirements.

Water Use Analysis - An analysis of sources and uses of water within the City was performed. The purpose of this was to estimate the number of cubic feet that will be billed by the BWSC in 1988.

Review of MWRA Assessment Practices - In 1987 the BWSC continued its comprehensive review of water and sewer assessments and methodologies of the MWRA. This review included:

- The applicability of Proposition 2 1/2 to the MDC Sewerage District during the years 1980 through 1984 should have resulted in reduced sewer assessments to the BWSC during those years. All member MDC communities, except BWSC, had received sewer assessment rate relief from the Massachusetts Department of Revenue because of the MDC's prior over-assessments which were in violation of Proposition 2 1/2. This matter is the subject of ongoing litigation by the BWSC.

IV. SOURCES AND USES OF WATER

IV.-1 Prior History, Trends and Conservation

The four major factors involved in projecting water use for rate setting purposes are as follows:

Forecasting the user population (i.e., how many people will be serviced?).

Determining water use patterns (i.e., what will the per capita water usage be?).

Determining the impact of conservation and pricing structures on total consumption.

Identifying losses in the system (through undermetering, leaks, etc.).

These factors are discussed below.

IV.-2 Population

In examining population trends, there were two major areas looked at: first, the residential characteristics of the City of Boston and second, the impact of commercial and industrial growth within the City.

Recent Boston Redevelopment Authority (BRA) reports on U.S. Census data have shown that the Boston population increased from 563,000 in 1980 to 601,095 as reported in the 1985 Census. Residential customers account for approximately 86% of all metered accounts however only for about 23% of the consumption volume. Commercial and industrial accounts have the largest impact on water consumption. In projecting usage patterns for 1988, only one major account is forecasted to be permanently terminated. There are, however, ongoing rehabilitation and renovation projects in the City which have reduced the water usage for those accounts during the construction phase of these renewal projects. The BRA is projecting the completion of approximately $265 million of rehabilitation as well as $972

million in new construction projects to be done within the City in 1988.

Based on the above data, in conjunction with anticipated water conservation efforts in the City, BWSC staff has projected a slight increase in water consumption for 1988. The impact of these factors will be reflected in the estimate of 1988 water consumption later in this study.

IV.-3 Water Use Patterns

Over the past ten years, withdrawals from the MDC's water supply systems have approached or exceeded the average safe yield (approximately 300 MGD) of its reservoir system. (See Total MDC/MWRA System Purchases in Exhibit G pg. 25).

In response to this situation, the MWRA undertook an examination of the long term availability of water supply in relationship to the long term needs and demands of its member communities. They also conducted an environmental, social and economic impact study of water and sewer rates and rate methodologies. During 1986, the Authority accepted the responsibility to meet the ongoing legitimate water supply needs of its constituency and to manage the assets of its water delivery system in order to conserve water at the wholesale and retail levels. The Authority's conservation measures are directed toward minimizing leakage, waste and excessive use. The Authority has adopted policies to institute educational programs to promote conservation and has encouraged its member communities to adopt conservation oriented rate structures.

The Commission, the largest user of water in the MWRA system, is directly affected by the MWRA legislation and

policies. In response, the Commission has placed added emphasis on its leak detection and metering programs in an effort to further reduce water purchased from the MWRA and to comply with the Authority's mandate to conserve water resources. In addition to the above conservation efforts, staff investigated the impact of various rate structures on customers' consumption habits, and with a supporting recommendation from the Commission's rate consultants, Camp, Dresser & McKee, the BWSC adopted an inclining block rate structure in 1985. Staff is recommending that this conservation oriented rate structure be continued in 1988. The impact on water sales is shown in Section IV.-5 "Estimating the Number of Billable Gallons."

Water billed to Boston users showed an increase from 1976 to 1979. During that time, the largest addition was due to the inclusion of the City of Boston's municipal accounts which occurred for the first time in 1978 and accounted for a 3% increase. From 1978 to 1984, increased public awareness of the importance of conservation appears to have offset the increase in commercial and residential water consumption in the City causing water sales to increase very slowly, if at all. The 1985 and 1986 water sales increased by 4% over the 1984 level due to a number of factors including growth in the City and the Commission's conversion to a more efficient billing system.

Since 1985, the Commission has been purchasing increased quantities of water from the MWRA. When combined with a relatively flat level of sales, this increased level of purchases has resulted in a decrease of approximately 2% in the proportion of sales to purchases over the past two years. Investigation and

an analysis performed by Engineering Consultants, Camp, Dresser and McKee, Inc., has indicated that a high level of unaccounted for water exists in the Southern High Service Area. This situation is of significant concern to the Commission. Staff, therefore, has intensified its leak detection efforts to this part of the system. As part of this effort, approximately 447 miles of water main were surveyed to pinpoint leakage which resulted in the identification of 441 leaks. Of this total, 57% have been repaired to date and the remainder are scheduled for repair in the Spring of 1988. Additional leak detection surveys are also planned for the remaining 179 miles of the Southern High Service during 1988. The continuation of the ongoing leak detection program will contribute to further elimination of unbilled water, and thereby reducing the level of unaccounted for water.

Exhibit G

WATER PURCHASES AND BILLING STATISTICS

MILLIONS OF GALLONS PER DAY (MGD) (1)

	Purchased Water from MDC/MWRA		Water Billed	Billings As
	Total MDC/MWRA System	Boston Consumption	To Boston Users	A Percent Of Purchases
	(MGD)	(MGD)	(MGD)	
1987(est)	307.1	122.9	81.8	66.6%
1986	293.4	120.9	81.3	67.2%
1985	299.0	119.2	81.3	68.2%
1984	291.0	117.3	78.0	66.5%
1983	293.6	125.3	76.9	61.4%
1982	297.3	128.6	78.6	61.1%
1981	309.1	132.2	78.4	59.3%
1980	312.7	135.2	80.6	59.6%
1979	307.9	137.3	81.5	59.4%
1978	317.1	143.0	79.9*	55.9%
1977	318.9	146.1	76.1	52.1%
1976	317.2	150.4	74.8	49.7%

* Billings to the City of Boston (i.e., Schools, Health and Hospital Facilities, Jails, etc.) account for approximately 3% of billable gallons and are included above, beginning in 1978.

(1) 7.48 gallons = 1 cubic foot

IV.-4 System Losses

In all mature cities such as Boston, there have always been discrepancies between wholesale water purchases and retail sales. Although it is recognized that the Boston system has a high loss rate, as illustrated in Exhibit G (pg. 25), over the past ten years, the Commission has reduced its unaccounted-for water by approximately 30% (from 48% in 1977 to approximately 33% in 1987). Unaccounted-for water results primarily from authorized public use, meter slippage, leaks, and breaks in the water distribution system. The Commission expects a further decline in unaccounted-for water in 1988 and thereafter.

In 1988, the Commission will begin to institute many of the programs recommended in the recently completed Water Distribution Study. These programs are designed to upgrade the entire water system and reduce the amount of unaccounted for water. These programs include:

- Increasing the length of pipe to be relaid from 5 miles per year to 12 miles per year.
- Instituting a 3 year valve upgrading program designed to facilitate leak detection efforts and to replace leaking valves.
- Instituting a hydrant upgrade program to improve fire protection and replace leaking hydrants.
- Instituting a corrosion control program to reduce pipe leakage and breakage.
- Increasing metering efforts to upgrade all commercial meters, to augment the large users meter testing program, and to continue the ongoing efforts of the 15 year meter replacement program.

Although some portion of the water lines within the existing distribution system are experiencing reduced carrying capacity due to age and a build-up of mineral deposits, the system

operates satisfactorily and is expected to continue to do so. The Commission is addressing the problems of reduced carrying capacity and leakage through a pipe relaying and relining program, and a systematic program of leak detection and repair. The Commission is also addressing the undermetering problem through an aggressive metering program.

IV.-5 Estimating the Number of Billable Gallons

An analysis of the major factors involved in forecasting water usage (i.e., population, conservation, city redevelopment, BWSC leak detection and metering programs) indicate a probable increase in billable water usage during 1988. As previously mentioned, the Boston Redevelopment Authority is projecting the completion of approximately $1.24 billion in construction projects.

The 1988 metering program will continue its emphasis on commercial and industrial users in downtown Boston as well as focusing on residential users. Over the next three years the program will incorporate technological advances in the area of electronic meter reading. This will include testing of computerized hand held reading devices and electronic probe devices for larger users whose meters are located in outside pits. Funds to address these advanced technological changes and the problems of undermetering have been included in the Commission's current Capital Improvements Program. The ongoing leak detection program will continue to eliminate unbilled water due to leaks.

The 1987 water sales are approximately 81.8 MGD and staff is projecting that sales for 1988 will increase slightly to a level of 82.0 MGD. Sewer sales are anticipated to follow the same usage trends as water and 1988 levels are projected to be 80.8 MGD.

IV.-6 City of Boston, Billable Water Volume

By statute, the BWSC began billing the City of Boston for water and sewer use in 1978. Because many City facilities were either unmetered or contained old or non-registering meters, an estimate of its water usage was used for billings in 1978, 1979, and 1980. Since 1981, actual metered billings have been initiated for nine City departments: the schools, police, fire, auditorium, parking, printing, libraries, public works and jail departments. Ongoing plans call for Health and Hospital facilities to be metered in the future. Estimated billings will continue to all other City departments while the Commission's metering program moves forward metering of all City facilities, whenever practical and cost effective.

Projected consumption by the City of Boston in 1988 is a composite based on actual usage by those departments which are metered and on estimated usage where the metering program is not complete. Estimated usage was developed by Coopers and Lybrand, a public accounting and consulting firm, when they assisted the Commission in preparing the 1979 Rate Study and has since been refined by staff. The projected 1988 consumption for the City of

Boston is as follows:

	Cubic Feet Per Day (1)
Schools & School Administration	100,300
Parks & Recreation	22,900
Health & Hospital Facilities	103,900
Jails	106,800
Police & Fire Facilities	12,900
Libraries, Auditorium & Other	58,900
	405,700

(1) 1 cubic foot = 7.48 gallon

V. FINANCIAL ANALYSIS

V.-1 Financial Analysis

The calculation of water and sewer rates requires the estimation of certain revenue and expense information. Exhibit H (pg. 31) presents the basic equation involved in determining the net revenue requirement, as well as a delineation of the revenue and expense categories. As defined by statute, BWSC must be self sustaining, therefore, it is mandatory that gross revenues be sufficient to meet the cost of total expenses. The gross revenue requirement reduced by other revenues, including the prior year's surplus, equals the net revenue requirement. The net revenue requirement divided by the total billable gallon figure is used to establish the water and sewer rate schedule.

In addition to determining the net revenue requirement based upon projections of certain revenues and expenses, the BWSC must determine its working capital needs. Working capital can be defined as the monies necessary to provide for continuity between the time that expenses are paid and revenues are received. As the BWSC must be self-supporting, working capital is an important segment of any rate analysis. The BWSC's current working capital requirements will be discussed later in this section.

Exhibit H

TOTAL EXPENSES

Less OTHER REVENUES

Equals NET REVENUE REQUIREMENT

TOTAL EXPENSES:
- Massachusetts Water Resources Authority Assessment
- Operating Expenses:
  - Wages and Related Benefits
  - Supplies and Materials
  - Contractual Repairs to System, Vehicles and Equipment
- Indirect Expenses:
  - Professional Services
  - Damage Claims
  - Utilities, Space and Equipment Rental
  - Other
- Capital Projects (Renewal and Replacement)
- Billing Adjustments/Bad Debt Allowance
- Elderly and Fully Disabled Discount
- Interest Expense
- Principal Repayment
- Deposit to Operating Reserve Fund
- Deposit to Renewal and Replacement Reserve Fund
- Deposit to Debt Service Stabilization Fund
- Working Capital Allowance

LESS:

OTHER REVENUES:
- Investment Income
- Miscellaneous Revenues:
  - -Special Service Fees
  - -Late Payment Charges
  - -Fire Service Fees
- Federal and State Reimbursements
- Prior Period Surplus
- Prior Period Bad Debt Adjustment
- Prior Period Uncollectable Late Payment Adjustment

EQUALS:

NET REVENUE REQUIREMENT:
- Water Revenues
- Sewer Revenues

V.-2 Water and Sewer Expenses

Water and sewer expenses, as categorized in Exhibit H (pg. 31), are presented in Exhibits I (pg. 33) and J (pg. 34).

MWRA assessments are the water and sewer charges to the BWSC for water purchased and sewage treatment services received. Operating expenses consist of those listed in Exhibit H. Indirect expenses are also delineated in Exhibit H. Capital projects, for rate setting purposes, are the Renewal and Replacement portion of the approved BWSC Capital Improvement Plan.

Interest expense, principal repayments and other debt service costs for Revenue Bonds and City of Boston General Obligation Bonds are discussed fully in Section VI, "Debt Service Requirements". The Working Capital Allowance is discussed more fully in Section V.-13.

Exhibit I

1988 WATER EXPENSES

(000'S)

MWRA Assessment	$17,655
Operating Expenses	13,887
Indirect Expenses	2,017
Capital Projects (Renewal & Replacement)	7,534
Billing Adjustments/Bad Debt Allowance	2,291
Interest Expense	5,017
Principal Repayment	1,187
Deposit to Reserve Funds	1,759
Elderly/Fully Disabled Discount	320
Allowance for Working Capital	1,562
Total	$53,229

Exhibit J

1988 SEWER EXPENSES

(000's)

MWRA Assessment	$24,369
Operating Expenses	11,507
Indirect Expenses	2,317
Capital Projects (Renewal & Replacement)	1,737
Billing Adjustments/Bad Debt Allowance	2,959
Interest Expense	6,686
Principal Repayment	1,353
Deposit to Reserve Funds	1,706
Allowance for Working Capital	1,588
Total	$54,222

V.-3 Elderly/Fully Disabled Discount Expense

Elderly homeowners, 65 years of age or older, or fully disabled homeowners, living in structures with 1 to 4 dwelling units, are currently eligible for a 15% discount on their water bill for that structure. Staff is recommending that the 15% discount be raised to a level of 20% effective April 1, 1988. Approximately 12,000 customers will take advantage of the elderly/fully disabled discount in 1988, and that the total expense would be approximately $320,000.

V.-4 Billing Adjustments and Bad Debt Expense

The categories of expenses called Billing Adjustments and Bad Debt Expense have been combined for reporting purposes.

Billing adjustments represent corrections to customers' accounts due to incorrect bills, inaccurate usage estimates or, in the case of sewer use, situations where the amount of wastewater returned is less than the amount of water used.

Bad debt expense represents amounts which are truly uncollectable.

Adjustments and bad debt expense processed during 1987 were approximately $6.4 million. In recognition of the historical trends and the continual emphasis on the qualitative aspects of the billing function. Staff is recommending that the 1988 provision for adjustments be set at approximately $5.2 million. Staff will continue to monitor adjustments and bad debt expense in order to ensure that the current level will be adequate to cover all transactions.

V.-5 Capital Projects

Capital projects involve renewal, replacement, extensions, and improvements to the water and sewer systems. The Commission has adopted a policy that renewal and replacement expenses be included in the net revenue requirement calculation and that extension and improvement expenditures be funded through borrowing.

The Commission continued to invest significant resources in renewing and improving the water and wastewater systems in the City of Boston during 1987. Nearly $28 million in capital construction work was completed in 1987, of which about 69% represented various federal and state contributions in aid of construction. Since 1978, the Commission's first year of operation, total investment in property, plant and equipment has been approximately $204 million.

The Commission is in the seventh year of a $75 million design and construction program to replace major sewer interceptor pipes that have served the City for approximately 100 years. This program is part of the Commission's effort to improve water quality in Boston Harbor and involves the reconstruction of over 20,000 feet of major sewer interceptor pipes through densely settled areas of the City. The ultimate goal is to eliminate dry weather overflows into Boston Harbor caused by insufficient capacity in portions of the system and to provide replacement where the system has deteriorated.

The Capital Improvement Program (CIP) for 1988-1990 prepared by BWSC staff, was presented for public review at a formal hearing in November 1987 and was adopted by the Board of Commissioners in December of 1987. The CIP evaluates each

proposed capital project in terms of projected costs, projected construction period, and projected benefits. Currently an amendment to the 1988-1990 CIP is being proposed by BWSC staff. The proposed amendment to the 1988-1990 CIP shows a reduction in the 1988 Renewal and Replacement budget from approximately $13.9 million to $9.3 million. This reduction results in the reclassification of approximately $2.3 million of water relay projects from renewal and replacement to increased capacity (extension and improvement funding). The balance represents the deferment of the construction of some water relay projects to 1989 to coordinate construction scheduling with Boston Public Works and Transportation Departments' activities.

In April, 1985, the Commission issued variable rate revenue bonds, its 1985 Series A General Revenue Bonds which included $31.6 million for extension and improvement capital projects for the period 1985-1987. This issue took advantage of favorable short-term rates over higher long term fixed rates. In addition, in August, 1986, the Commission issued its 1986 Series A General Revenue Bonds to provide a guaranteed take out for the 1985 variable rate bonds at historically attractive long term fixed rates. The 1986 revenue bonds also provide funds for the Commission's capital needs for 1988 and 1989.

As a result, the 1988 rate schedule includes a portion of the debt service costs of the 1985 and 1986 revenue bonds plus all of the debt service cost for the Commission's 1984 revenue bonds, its 1984 Series, which were issued, at no additional cost to the Commission, to refund 1980 revenue bonds (see Section VI). These debt service costs will total approximately $13.1 million in 1988. The capital project costs which are included in the

1988 revenue requirement include these debt service costs as well as the costs of renewal and replacement for construction work which are not financed from bond proceeds.

V.-6 Water and Sewer Revenues

As noted previously, rates must be set so that estimated total revenues of the BWSC equal estimated total expenses. The bulk of the revenues will be collected through user charges (net revenue requirement). However, a portion of the gross revenues will be realized from a variety of other revenue sources. These include:

- o Special service fees
- o Special fire service fees
- o Late payment charges
- o Investment income
- o Federal and state reimbursements

These other revenue sources, including the projected surplus from 1987, as detailed in Exhibit L, (pg. 44), will provide approximately 12% of the gross revenue requirement. The following is a description of each item and the method used to estimate revenues anticipated from each.

V.-7 Special Service Fees

The Commission has established special service fees to recoup the cost of providing additional services, where needed, without burden to the general rate payers.

A number of special services are provided by the Commission. It is policy of the Commission to review the approximate cost and frequency of special services each year. Based upon the results

of this year's review, Staff has recommended an increase for a majority of the fees to more accurately reflect the Commission's cost of rendering these services. This year Staff has included a proposed $150 per diem fee to recover the costs of providing the necessary water and sewer inspectional services associated with construction projects of one or more days duration. In addition, a Special Service Fee is being proposed for the cost of replacing a customer's frozen meter. The Special Service Fee schedule is included herein as Exhibit C, (pg. 9).

The resulting projected revenues from the special service fee schedule is set forth in Exhibit K (pg. 41). It details the estimated revenues which are generally expected to cover the cost of providing the corresponding services.

V.-8 Late Payment Charges

Prior to 1978, water and sewer services were provided by the City of Boston. The collection policy was such that there was little encouragement for prompt payment. As unpaid bills eventually became liens on property, most bills were ultimately paid. However, typically 27% of billings remained uncollected prior to water and sewer charges being added to property taxes. Because the Commission is required to break-even each year, a late payment charge has been in place since 1978 to encourage more timely payments. This mechanism, in addition to other collection procedures instituted by the Commission, has been successful to the extent that approximately 98% of billings are now paid within twelve months. In 1988, staff recommends the continuation of the late payment charge, at the rate of .03288% per day compounded with each billing on all amounts past due

(approximately equal to 12% per annum), to help maintain the pace of improvement in the collection rate. Late charge revenue in 1988, net of an allowance of 27%, is projected to be $2.6 million.

Exhibit K

OTHER REVENUE

NAME	FEES	ESTIMATED FREQUENCY	ESTIMATED ANNUAL REVENUE
FIRE FLOW TEST	$150	80	$12,000
RETURN CHECK PROCESSING	$ 15	500	$7,500
TEMPORARY CONNECTION			
-greater than 2 Days	$195	70	$13,650
-less than 2 Days	$ 25	40	$1,000
WATER PIPE INSPECTION	$110	450	$49,500
SEWER PIPE INSPECTION	$110	400	$44,000
WATER SERVICE INSTALLATION	$280(Avg)	25	$7,000
SPECIAL METER TESTS	$ 40(Avg)	200	$8,000
DRAIN LAYERS LICENSE	$ 12	500	$6,000
MULTI-DAY CONSTRUCTION INSPECTION	$150/diem	75	$11,250
FIRE PIPE EXCAVATION Cost Basis (approx.$2500)		1	$2,500
EXCAVATION Cost Basis (approx.$900)		1	$ 900
LIEN CERTIFICATE	$ 25(Avg)	4,500	$112,500
SCRAP SALES	-	-	$7,000
WATER TURN-ON/ TURN-OFF (1)	$ 25	225	$5,625
CONSTRUCTION PLANS AND DRAWINGS	$ 2	2,500	$5,000
FROZEN METER REPLACEMENT	$ 98(Avg)	215	21,000
CROSS CONNECTION INSPECTION	$ 75	3,000	$225,000
TOTAL:			$539,425

(1)For services affected by the Commission's termination of service procedures.

V.-9 Fire Pipe Charges

Industry standards generally prescribe that acceptable rate making practices include imposing fire pipe fees to recoup a portion of net water revenue requirements. The American Water Works Association has determined in its Manual M26 that:

"The costs of providing private fire-protection service to individual properties represent a service not directly benefitting the general customer population of the utility. Such a service provides a measurable benefit that can reasonably be charged for through a system of rates and charges to those customers receiving private fire-protection service."(1)

The installation of a private fire-protection system has value to property owners and tenants, since fire insurance premiums are substantially reduced while fire fighting capabilities are enhanced. In addition, the BWSC incurs costs associated with the fire protection system; specifically, the maintenance and surveillance of the connections to the water system and the unmetered water use inherent in any fire protection system.

In past years fire pipe charges have been set to recover approximately three percent of the net water revenue requirements. Staff is recommending the continuation of this practice for 1988.

The following table summarizes the quarterly fire pipe charges for 1988 proposed to be effective on April 1, 1988:

Size of Service	Quarterly Charge
4 inch or smaller	$ 56.75
6 inch	$ 127.50
8 inch or larger	$ 226.50

There are approximately 3,965 such connections in the City. The anticipated revenue at these rates is $1,431,000 for 1988.

(1) American Water Works Association Manual M26, "Water Rates and Related Charges," 1986.

V.-10 Investment Income

BWSC has a number of large expenses which are paid in lump sum installments on a semi-annual basis, such as principal and interest payments. By utilizing effective money management techniques, the monies accumulated to meet these expenses will earn investment income. In addition, the reserve requirements of certain trust indentures are also available for investment purposes. The investment income which is earned serves to reduce water and sewer rates. Based upon a cash flow analysis, investment income for the calendar year of 1988 is estimated to be $ 4.8 million.

Projected investment income is based on an estimated return rate of approximately 6.5% during 1988. This estimate was developed in conjunction with the Commission's financial advisor, senior underwriter and other appropriate economic sources.

V.-11 Surplus

The legislation that created the BWSC requires that any surplus either be returned to the City of Boston or utilized to offset the following year's rates and that any deficit be recovered in the following year's rates. In the past, the Commission has elected to use any excess to reduce rates. There is a projected surplus of $ 3.5 million in 1987 (detailed in Exhibit L, pg. 44) which has been incorporated in the rate calculation to decrease the 1988 net revenue requirement. This surplus is the result of $ 1.7 million of revenue exceeding the budget, and other controllable expense underruns of $ 1.8 million.

Exhibit L

1987 SURPLUS ANALYSIS
(000'S)

1987 REVENUES	@ 12/31/87 (unaudited)
Water Revenues	$35,302
Sewer Revenues	40,816
Prior Period Surplus Adjustment	8,863
Fire Service Fees	1,022
Investment Income	5,123
Late Payment Income	2,593
Federal Reimbursement	208
Other Income	980
Prior Period Bad Debt Allowance	1,400
TOTAL:	$96,307
1987 EXPENSES	
MWRA Assessment	$34,365
Operating Expenses	23,610
Indirect Expenses	4,698
Capital Projects	6,470
Adjustments	6,387
Elderly/Fully Disabled Discount	196
Deposit to Reserves	3,155
Interest Expense	11,279
Principal Repayment	2,690
TOTAL:	$92,850
Excess 1987 Revenues over 1987 Expenses Available for Reduction to 1988 Net Revenue Requirement (1)	$3,457

(1)The distribution of this 1987 surplus has been allocated to the water and sewer rates with water accounting for $1,604 and sewer for $1,853. This allocation reflects the relative ratios of the water and sewer net revenue requirement adopted in 1987 (i.e. Water - 46.4% Sewer - 53.6%).

V.-12 Self-Insurance Reserve

Since 1978, funds have been included in the net revenue requirement to provide the Commission with protection against damage claims, law suits and court settlements related to operating the water and sewer systems. Because of the extremely high cost of purchased insurance, it was determined that a self-insurance fund was the most appropriate method of providing insurance protection.

In 1980, the Commission's risk managers determined that a $2 million insurance reserve fund was sufficient. This fund was set up using revenues raised from user charges in 1978 and 1979. A re-evaluation of the adequacy of the Commission's self-insurance reserve was conducted in 1986 which resulted in the determination that the reserve would be more appropriately funded at a level of $2.5 million. Therefore, $500,000 from the sale of the Commission's 1986 Series A General Revenue Bonds was deposited to this reserve fund.

Annually since 1982, user charges included only amounts necessary to reimburse the insurance reserve fund for claims actually paid. For 1988, staff recommends including $250,000 in user charges to provide for such claims.

An annual audit of the insurance reserve for adequacy has been and will continue to be performed.

V.-13 Working Capital Requirements

The Commission's ongoing working capital requirement is based on the need to "bridge" the time delay between when revenues are received and when expenses are actually paid. The lag between actual water usage, billing for that usage, and

collection of those billings, and the lag between the recognition of expenses and the payment of those expenses are all factors in determining working capital requirements. Since inception, the Commission has undertaken an aggressive program to reduce the slow collection portion of the Bad Debt and Slow Collection Allowance. This program has consisted of: the institution of a late payment charge; the staffing of a collection department; the adoption of Billing Termination and Appeal Regulations which set forth a termination of service methodology; and the development of a comprehensive dunning program. These measures have resulted in a one-year collection rate on Commission billings of over 98% (i.e. percent of billings collected within 360 days of being rendered, net of a 3% allowance for uncollectable amounts). However, over the past few years additional demands have been placed on working capital requirements as a result of the size and frequency of MWRA assessment increases. The Commission's bond covenants require that monthly deposits to reserve accounts to meet calendar year assessment payments be initiated at the beginning of the year. The Commission rate increases which are calculated to include the increased assessment have routinely been implemented at the beginning of the second quarter. This three month lag which has continually been a drain on working capital has become more severe as the percentage increase in MWRA assessments continues to escalate.

In the past, The Commission has always been able to meet its working capital requirement through internally generated funds. As further discussed in the Debt Service Requirements Section, these internally generated funds have come from the collection of accounts receivable inherited by the Commission from the City of

Boston. Staff recommends that the practice of using these already collected "old receivables" for ongoing working capital needs be continued in 1988. However, additional collections of these receivables are expected to be negligible in the future. This, in conjunction with additional demands results in Staff recommending the inclusion of $3.1 million for working capital needs in this year's rate calculations.

As with any business, an increase in the working capital requirement places financial pressure on the business and in the case of the Commission, to the consumer. Staff will continue to emphasize the reduction of working capital in 1988 through efforts to improve the collection of receivables and the timeliness of billings. In addition, Staff will review various alternatives including the future feasibility of recommending a one time rate adjustment to compensate for the continued level of substantial assessment increases by the MWRA and its resulting impact to working capital.

VI. DEBT SERVICE REQUIREMENTS

VI. DEBT SERVICE REQUIREMENTS

The Commission's debt currently consists of two components: Revenue Bonds and City of Boston Water and Sewer General Obligation Bonds. Each of these two types of debt is described below.

VI.-1 Revenue Bonds

In December of 1980, the Commission retired all of its outstanding bond anticipation notes and borrowed funds for capital improvements by issuing $66.7 million in revenue bonds. In December 1984, in order to adopt a new bond resolution which would provide additional flexibility in financing structures, the Commission sold $69.7 million in revenue bonds as a break-even refunding of the 1980 bonds. The present value of the principal and interest payments on the 1984 bonds produced a slight savings over the cost of the 1980 bonds.

In 1985, the Commission executed some of the flexibility provided for in its new bond resolution by issuing $51 million of variable rate debt. Under this "flexi-note" program, the Commission was able to access the short term bond market which had historically traded at interest rates lower than the long term market. This issue has and will continue to generate substantial savings to the Commission.

The final element of what is termed the Commission's "Financing Trilogy" culminated in August of 1986 with the execution of a combination rolling cross-over refunding and new money issue of $85 million of General Revenue Bonds. The refunding portion allows the Commission to continue to pay the low short term interest rates associated with the 1985 "flexi-note"

program. At the same time, the issue has secured a guaranteed take out for the 1985 bonds at historically low long term interest rates in the event of future higher short term rates. The 1986 Revenue Bonds also provide funds for the Commission's capital improvement needs through 1989. The 1988 debt service cost on all of the Commission's outstanding revenue bonds is $13,140,682.

The $69.7 million 1984 Revenue Bonds, the $51 million 1985 Revenue Bonds and the $85 million 1986 Revenue Bonds are the obligation of the Commission and were sold based on the ability of the Commission to generate revenues from user charges.

As with all similar revenue bonds, the Commission was required to make certain covenants with respect to the operation of the system. The covenants are contained in a document entitled General Revenue Bond Resolution (the "Resolution"). The Resolution requires the Commission, among other things, to fund certain reserves and meet a net revenue earnings test on an annual basis. Based on projected 1987 operating results and budgeted 1988 spending, the Resolution requires a deposit of an additional $2.4 million in the Operating and Renewal & Replacement Reserve Funds and a $1.0 million provision to the Debt Service Stabilization Fund for 1988.

In addition, under stipulations of the Resolution, the Commission is required to maintain rates and charges sufficient to produce net revenues (as defined in the Resolution) equal to at least 125% of the maximum principal and interest payment due in any future year. The proposed rate schedule allows the Commission to satisfy this requirement in 1988.

VI.-2 City of Boston Water and Sewer General Obligation Bonds

Chapter 436 of the Acts of 1977 of the Massachusetts Legislature requires the Commission to pay the principal and interest on any outstanding water and sewer General Obligation Bonds of the City of Boston. As of January 1, 1988, the total outstanding principal of this debt was $3,525,000. This debt bears interest ranging from 2% to 10% and will be retired by 1999. The principal and interest payments in 1988 total $879,123.

As in all past years, in 1988, staff recommends that $13,140,682 of principal and interest payments due on the Revenue Bonds and $879,123 of principal and interest payments due on the City Bonds be raised through the user charge mechanism. In addition $3.5 million in required reserve fund deposits is included in user charges.

VI.-3 Pre-Commission Receivables

Upon its formation, the Commission received an asset of approximately $33 million in accounts receivable and unbilled revenue from the City of Boston. To date, the billing and collection of these accounts receivable have been used for working capital, the payment to the City of Boston for 1977 operating expenses and revenue collection fees, debt reduction, funding reserve requirements and net earnings test requirements. In 1988 as additional collections of these receivables is expected to be negligible, none of these monies are included in 1988 revenues. There has been an allowance for working capital requirements provided for in the 1988 rate schedule. (See Section V-14).

VII. RATE CALCULATION

VII.-1 Rate Setting Factors

Rate Structure:

Under the enabling legislation, the Commission is required to set rates and charges so as to provide revenues at least sufficient to (i) pay all current expenses, (ii) pay all debt service, (iii) create and maintain reasonable reserves required by any bond resolution, (iv) provide funds for paying the cost of all necessary repairs, replacements and renewals of the system and (v) pay or provide for any and all other amounts which the Commission may be obligated to pay or provide for by law or contract. In addition, in order to qualify for certain federal and state grants, the Commission is required to and has set wastewater charges on a basis approved by the EPA at levels sufficient to cover the operation, maintenance and replacement costs of providing wastewater services. Under legislation creating the MWRA in 1985, the Commission has the option to use either a flat rate structure or an increasing block rate structure designed to encourage and support conservation efforts mandated by the MWRA Act. Staff is recommending the continuation of conservation oriented increasing block rates proposed to become effective on April 1, 1988.

Relationship of the Capital Improvement Program To Rates:

The 1988-1990 Capital Improvement Program has been reviewed and approved by the Board of Commissioners. Currently an amendment to the 1988-1990 Capital Improvement Program is being proposed by Staff (see discussion in Section V.-5). Implementation of this program is important for the integrity of the system and for rate stability (see following section). The portion of this activity that consists of ongoing maintenance (i.e., system for renewal and replacement) is appropriately included as an expense for rate setting purposes (see pg. 36). In this regard, the Commission utilizes encumbrance accounting, an accounting method which allows expenses to be encumbered prior to actual spending. This method is commonly used by governmental entities and has the effect of freezing resources so they may be committed to a particular action.

This treatment will permit rate stability and simplify the process of maintaining an ongoing Capital Improvement Program. Staff recommends the continuation of this method in 1988.

Relationship of System Integrity to Rates:

BWSC derives a significant portion of its revenues from water that is metered; the City of Boston is an exception where some usage has been estimated. Rates are affected by the accuracy of the meters and the structural integrity of the system (the amount of water lost through leaks, breaks, etc.). Since all water supplied to Boston is purchased from the MWRA, it is obvious that customers who are accurately metered must also pay for those who are undermetered. Similarly, all customers pay for leaks and breaks. Thus, money spent on metering and improving the system will serve to make rates more equitable and stable for all customers.

VII.-2 Determination of Rate Blocks

Staff is recommending the level of each of the rate blocks remain the same as established in 1985 based on equity and conservation and two additional criteria, namely, adequacy of revenues and rate continuity. Adequacy of revenues, or the ability of the rate structure to cover all expenses, is of prime importance to BWSC. The Commission must be assured that the rates it charges will pay for all expenses, including capital costs. Barring major unforeseen circumstances, the rates which Staff is recommending will be adequate to recover the Commission's total cost of service for 1988. Rate continuity means that any group of customers should not be burdened with excessive increases over a short period. The proposed rate schedule shows a combined quarterly water and sewer bill increase of 27.8%.

The current levels of each of the block rates will continue to give customers time to adjust their consumption habits. Staff will continue to monitor the block levels as actual consumption patterns develop to ensure that the integrity of the block rate structure is maintained. The review which was conducted for 1987 to evaluate the data since the adoption of block rates has not substantiated significant alterations in consumption patterns. It is, however, difficult to isolate the effects of conservation from the results of an aggressive leak detection and metering program when coupled with increasing development and continued economic strength in the City.

VII.-3 Determination of Net Revenue Requirements

Exhibits M and N, presented at the end of this section, illustrate the basis for the determination of the water and sewer net revenue requirements and include appropriate values for all revenue and expense items for 1988. This produces the following net revenue requirements for 1988:

Water - $46,261

Sewer - $48,163

VII.-4 Rate Calculation

In Section IV the determination was made that 79.0 million gallons per day will be billable in 1988. Adding the 3 million gallons estimated for the City of Boston produces a daily total of 82.0 million gallons per day or 30,012,000,000 gallons annually. The calculation of the water and sewer requirements are shown on pages 56 and 57. The impact of the proposed rate schedule on various users is shown in Exhibit B (pg. 8).

Water Rate:

1988 Net Water Revenue Requirement	$ 46,261,000
Less: Revenue at Current Rates (January 1, 1988 - March 31, 1988) Billable Gallons at Current Rates	(8,899,040)
Net Revenue Requirement at Proposed Rates (April 1, 1988 - December 31, 1988) Billable Gallons at Proposed Rates	$37,361,960

BOSTON WATER AND SEWER COMMISSION
REVENUE ANALYSIS FOR PROPOSED WATER RATES (4/1/88)

CBIC FEET PER DAY AGE BLOCK	ESTIMATED BILLED USAGE (CF/DAY)	ESTIMATED BILLED USAGE (GAL*1000)	BILLED USAGE %	PROPOSED RATE ($/1000 CF)	ESTIMATED * REVENUE PER BLOCK
19	69,623,262	520,782	1.74%	12.232	$794,585
-39	258,486,364	1,933,478	6.46%	12.253	$2,955,031
-89	560,987,433	4,196,186	14.02%	12.284	$6,429,586
-159	316,105,615	2,364,470	7.90%	12.315	$3,632,158
0-349	374,125,000	2,798,455	9.35%	12.346	$4,309,721
0-599	275,692,112	2,062,177	6.89%	12.367	$3,181,181
0-1299	438,546,524	3,280,328	10.96%	12.399	$5,073,118
00-2999	451,350,802	3,376,104	11.28%	12.430	$5,234,389
00-5999	317,706,150	2,376,442	7.94%	12.451	$3,690,661
00 OR >	938,713,636	7,021,578	23.46%	12.482	$10,932,000
	4,001,336,898	29,930,000	100.00%		$46,232,431

82.0 MGD	· REVENUE FROM PROPOSED RATE (4/1/88 - 12/31/88)	$37,333,390
	REVENUE REQUIREMENT	$37,361,960
	SURPLUS/(DEFICIT)	($28,570)

* Current rates through 3/31; proposed rates from 4/1 through 12/31

Sewer Rate:

1988 Net Sewer Revenue Requirement	$48,163,000
Less: Revenue at Current Rates (January 1, 1988 - March 31, 1988) Billable Gallons at Current Rates	(10,523,400)
Net Revenue Requirement at Proposed Rates (April 1, 1988 - December 31, 1988) Billable Gallons at Proposed Rates	$37,639,600

BOSTON WATER AND SEWER COMMISSION
REVENUE ANALYSIS FOR PROPOSED SEWER RATES (4/1/88)

CUBIC FEET PER DAY USAGE BLOCK	ESTIMATED BILLED USAGE (CF/DAY)	ESTIMATED BILLED USAGE (GAL*1000)	BILLED USAGE %	PROPOSED RATE ($/1000 CF)	ESTIMATED * REVENUE PER BLOCK
0-19	68,604,385	513,161	1.74%	11.934	$789,554
20-39	254,703,636	1,905,183	6.46%	12.075	$2,965,640
40-89	552,777,861	4,134,778	14.02%	12.217	$6,510,725
90-159	311,479,679	2,329,868	7.90%	12.350	$3,707,945
160-349	368,650,000	2,757,502	9.35%	12.491	$4,438,174
350-599	271,657,594	2,031,999	6.89%	12.633	$3,307,076
600-1299	432,128,770	3,232,323	10.96%	12.775	$5,318,811
1300-2999	444,745,668	3,326,698	11.28%	12.907	$5,530,185
3000-5999	313,056,791	2,341,665	7.94%	13.049	$3,934,870
6000 OR >	924,976,364	6,918,823	23.46%	13.153	$11,724,735
	3,942,780,749	29,492,000	100.00%		$48,227,715

80.8	REVENUE FROM PROPOSED RATE (4/1/88 - 12/31/88)	$37,704,310
	REVENUE REQUIREMENT	$37,639,600
	SURPLUS/(DEFICIT)	$64,710

(*) Current rates through 3/31; proposed rates from 4/1 through 12/31

Exhibit M
1988 WATER RATE CALCULATION
(000's)

REVENUES

NET REVENUE REQUIREMENT	$46,261
Prior Year Surplus	1,604
Net Adjustment to Prior Period	-0-
Miscellaneous Revenues:	
- Investment Income	2,378
- Late Payment Income	1,288
- Other Income	267
- Fire Service	1,431
TOTAL	$53,229

EXPENSES

MWRA Assessment	$17,655
Operating Expenses	13,887
Indirect Expenses	2,017
Capital Projects (Renewal & Replacement)	7,534
Billing Adjustments/Bad Debt Allowance	2,291
Interest Expense	5,017
Principal Repayment	1,187
Deposit to Reserve Funds	1,759
Elderly/Fully Disabled Discount	320
Allowance for Working Capital	1,562
TOTAL	$53,229

Exhibit N

1988 SEWER RATE CALCULATION

(000's)

REVENUES

NET REVENUE REQUIREMENT	$48,163
Prior Year Surplus	1,853
Net Adjustment to Prior Period	-0-
Miscellaneous Revenue:	
- Investment Income	2,422
- Late Payment Income	1,312
- Other Income	272
- Federal Reimbursement	200
TOTAL	$54,222

EXPENSES

MWRA Assessment	$24,369
Operating Expenses	11,507
Indirect Expenses	2,317
Capital Projects (Renewal & Replacement)	1,737
Billing Adjustments/Bad Debt Allowance	2,959
Interest Expense	6,686
Principal Repayment	1,353
Deposit to Reserve Funds	1,706
Allowance for Working Capital	1,588
TOTAL	$54,222